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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A23G 3/30	A1	(11) International Publication Number: WO 99/17618 (43) International Publication Date: 15 April 1999 (15.04.99)
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<p>(54) Title: CHEWING GUM CONTAINING ARABINOGALACTAN</p> <p>(57) Abstract</p> <p>Chewing gums containing arabinogalactan and methods of making such gums are disclosed. In one embodiment, the gum comprises about 5 % to about 95 % gum base, about 0.1 % to about 10 % flavoring agent and arabinogalactan, the arabinogalactan being part of the bulking agent in the gum. The arabinogalactan provides the gum with unique properties, and the gum is non-cariogenic. In other embodiments, the arabinogalactan is codried with sweeteners or coevaporated with a plasticizing syrup to produce unique sweetening ingredients and syrups for gum. The arabinogalactan may also be provided in the form of a rolling compound on the gum, or used with sugars or polyols to form a hard coating for a coated pellet gum.</p>		

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Chewing Gum Containing Arabinogalactan

BACKGROUND OF THE INVENTION

5 The present invention relates to improved compositions of chewing gum. More particularly, the invention relates to improving chewing gum by the use of specific bulking agents in sugar and non-sugar chewing gum products to give improved texture, moisture absorption properties, and improved shelf life properties. The improved chewing gum compositions may also be used in a variety of chewing gum products such as confectionery coated chewing gum products.

10 In recent years, efforts have been devoted to replace sugar and sugar syrups normally found in chewing gum with other carbohydrates and non-carbohydrates. Non-sugar or sugar-free chewing gum, which is growing in popularity, uses sugar alcohols or polyols to replace sugar and sugar syrups. The most popular polyols are sorbitol, mannitol and xylitol. New polyols are
15 being developed using new technology to replace these polyols. New polyols have various unique properties which can improve the taste, texture and shelf life properties of chewing gum for consumers.

The non-sugar polyols have the advantage of not contributing to dental caries of consumers, as well as being able to be consumed by diabetics.
20 However, all polyols have the disadvantage of causing gastro-intestinal disturbances if consumed in too great of a quantity. Therefore it would be a great advantage to be able to use a carbohydrate or carbohydrate-like food ingredient for chewing gum that would act as a bulking agent, but not contribute to dental caries nor cause gastro-intestinal disturbances.

25 One such bulking agent is arabinogalactan, also referred to as larch gum. Although arabinogalactan is found in most plant life, the various species of larch trees are most useful for commercial production. Arabinogalactan, a carbohydrate polymer of galactose and arabinose is GRAS approved for use in food products in the U.S. Although a

carbohydrate, arabinogalactan is a natural gum that may not contribute to dental caries, nor it may not cause gastrointestinal disturbances. Thus, this ingredient's use in chewing gum could be a definite improvement.

5 Arabinogalactan is a natural water soluble polymer that has the highest water solubility and the lowest viscosity of the natural carbohydrate polymers, including gum arabic. These characteristics make arabinogalactan useful in a wide variety of applications including coatings, detergents, encapsulation, foods, personal care products, and pharmaceuticals.

10 As an encapsulating agent, use of arabinogalactan to coat food acidulents to make them more water soluble is disclosed in U.S. Patent No. 3,716,374. A gelatin type jelly desert that uses an encapsulated flavor made by spray drying with arabinogalactan is disclosed in U.S. Patent No. 3,264,114. In U.S. Patent No. 4,228,198, arabinogalactan is added to a sweetening composition containing thaumatin, monellin, or saccharin to
15 enhance sweetness and suppress aftertaste.

SUMMARY OF THE INVENTION

The present invention is a method of producing chewing gum with arabinogalactan, as well as the chewing gum so produced. The bulking agent may be added to sucrose-type gum formulations, replacing a small or large
20 quantity of sucrose. The formulation may be a low- or high-moisture formulation containing low or high amounts of moisture-containing syrup. The bulking agent, arabinogalactan, may also be used in low- or non-sugar gum formulations replacing sorbitol, mannitol, other polyols, or carbohydrates. Non-sugar formulations may include low- or high-moisture, sugar-free
25 chewing gums.

The bulking agent, arabinogalactan, may be combined with other bulking agents for use in chewing gum, including but not limited to sucrose, dextrose, fructose, maltose, maltodextrin, xylose, as well as sugar alcohols including but not limited to sorbitol, mannitol, xylitol, maltitol, lactitol,
30 hydrogenated isomatulose and hydrogenated starch hydrolyzates such as

Lycasin. The bulking agent, arabinogalactan, may be combined in the gum formulation or co-dried or blended with the other bulk sweeteners prior to use in the gum formulation. Co-drying may be done by various methods of spray drying, fluid bed coating, coacervation, and other granulating or agglomerating techniques. The bulking agent, arabinogalactan, may also be combined with high potency sweeteners including, but not limited to, thaumatin, aspartame, acesulfame K, sodium saccharin, glycyrrhizin, alitame, cyclamate, stevioside and dihydrochalcones.

This material, when used as a bulking agent, gives chewing gum an improved texture, an improved shelf life and unique flavor/sweetness quality. Even though arabinogalactan is a carbohydrate, it is not cariogenic, nor does it cause gastro-intestinal disturbances, giving a highly consumer-acceptable chewing gum product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Arabinogalactan is a carbohydrate polymer of galactose and arabinose. Arabinogalactan is a naturally occurring polysaccharide extracted from the Larch tree, and has the highest solubility and lowest viscosity of any known natural hydrocolloid.

Larch trees are the most useful for commercial production of arabinogalactan and are a most abundant renewable resource in North America. Arabinogalactan is available from Larex, Incorporated, 2852 Patton Road, St. Paul, Minnesota, under the tradename L'Extra™ as a food grade material. It is also available for other applications under the tradenames LARA-Print™, LARACare™, and Cellsep™. The material is available as a spray-dried powder or as a liquid of 50% concentration.

Arabinogalactan is permitted as a direct food additive and is FEMA-GRAS in flavor systems. Arabinogalactan is not a sweetener, but is considered a flavor enhancer. It has no noticeable sweetness itself, but when incorporated in compositions with a protein sweetener, such as thaumatin or

monellin, saccharin, or cyclamate, it enhances the overall sweetness of the composition and reduces any unpleasant aftertaste.

5 As noted previously, arabinogalactan is a highly branched polymer of arabinose and galactose having galactose units and arabinose units in the approximate ratio of six to one. Arabinogalactan is used in food as an emulsifier, stabilizer, binder, or bodying agent for essential oils, and is used in non-nutritive sweeteners, flavor bases, non-standardized dressings and pudding mixes.

10 It has been reported that arabinogalactan is non-digestible and thus could have a very low caloric value. As it is considered a high fiber material along with its high water solubility and low viscosity at high concentrations, arabinogalactan makes an excellent bulking agent for chewing gum. Because of its binding and film forming properties, arabinogalactan also makes an excellent additive to sugar and polyol coatings for chewing gum
15 products.

Arabinogalactan may be added to chewing gum in its powder form or may be dissolved in water. Its solubility in water is above 50% at room temperature, but increases further with increased temperature. Arabinogalactan may be used in chewing gum as a texture and flavor
20 modifier, bulking agent, and may improve texture, flavor, and shelf life properties. Arabinogalactan may replace solids like sucrose, dextrose or lactose when used in its powder form, or may replace syrups when used in its liquid or syrup form. At levels of about 0.5% to about 25%, arabinogalactan may replace part of the solids in sugar gum or, as a liquid, all or part of the
25 syrup in sugar gum. At higher levels of about 25% to about 70% of the gum formulation, arabinogalactan may replace all of the solids in a chewing gum formulation.

Unique chewing gum formulations can be obtained when all bulk
30 sweeteners are replaced with arabinogalactan powder and syrup. The low sweetness intensity allows for use of unique flavor combinations such as

savory flavors. High intensity sweeteners may be added to increase sweetness to obtain a sweetness more typical of chewing gum formulations. Chewing gum formulations with arabinogalactan may contain a very low amount of moisture in the gum formulation, i.e., below about 2%, or may contain a medium amount of moisture, about 2-5%, and may even be a soft gum formulation containing 5% moisture or more.

Arabinogalactan's non-cariogenic properties suggest it may be used in chewing gum formulations containing non-sugar ingredients. Non-sugar ingredients are alditols such as sorbitol, mannitol, xylitol, lactitol, hydrogenated isomaltulose, maltitol and hydrogenated starch hydrolyzates. These alditols are used in a variety of combinations to develop unique sugarless chewing gum formulations. Arabinogalactan may be used to replace the individual alditols or combinations of alditols. With partial replacement of one or more alditols, arabinogalactan can be used at levels of about 0.5-25%. If arabinogalactan replaces a large amount or most of the alditols, this level may be about 25% to about 90% of the gum formulation.

Some sugar-free chewing gum formulations contain high levels of glycerin and are very low in moisture, i.e., less than about 2%.

Arabinogalactan solids or syrup may replace part or all of the glycerin used in these types of formulations. At higher moisture levels (more than 2%) in sugar-free gum, a liquid sorbitol (70% sorbitol, 30% water) is used.

Arabinogalactan solids or arabinogalactan syrup may replace part or all of the sorbitol liquid. New sugar-free syrups like hydrogenated starch hydrolyzates, such as Lycasin, may also be replaced in part or totally by arabinogalactan solids or syrup. The same product advantages found with hydrogenated starch hydrolyzates syrups, such as improved product shelf life, improved texture and improved aspartame stability, may also be found with the use of arabinogalactan solids or syrup.

Recent advances use hydrogenated starch hydrolyzates (HSH) and glycerin preblended and co-evaporated to reduce moisture in some sugar-

free gum formulations. Arabinogalactan solids and/or syrup may be used to replace part or all of the HSH/glycerin blends in chewing gum formulations. Aqueous arabinogalactan solids and/or arabinogalactan syrup may also replace HSH in the preblend with glycerin and be co-evaporated with glycerin to obtain a low moisture, non-crystallizable blend. Combinations of arabinogalactan solids/syrup with alditols like sorbitol, maltitol, xylitol, lactitol and mannitol in aqueous form may also be blended with glycerin and co-evaporated for use in low-moisture, sugar-free gum.

In a similar manner, arabinogalactan solids/syrup preblended in glycerin and co-evaporated may be used in conventional sugar chewing gum formulations. Arabinogalactan may be combined with other sugars like dextrose, sucrose, lactose, maltose, invert sugar, fructose and corn syrup solids to form a liquid mix to be blended with glycerin and co-evaporated. Arabinogalactan solids/syrup may also be mixed with syrup and blended with glycerin and co-evaporated for use in a sugar chewing gum formulation.

Arabinogalactan bulking agent may also be co-dried with a variety of sugars such as sucrose, dextrose, lactose, fructose and corn syrup solids and used in a sugar-containing gum formulation. Arabinogalactan may be co-dried with a variety of alditols such as sorbitol, mannitol, xylitol, maltitol, hydrogenated isomatulose and hydrogenated starch hydrolyzates and used in a sugar-free gum formulation. Co-drying refers to methods of co-crystallization and co-precipitation of arabinogalactan with sugars and alditols, as well as co-drying by encapsulation, agglomeration and absorption with sugars and alditols.

These techniques include, but are not limited to, spray drying, spray chilling, fluid-bed coating and coacervation. These encapsulation techniques that give partial encapsulation or full encapsulation can be used individually or in any combination in a single step process or multiple step process.

Generally, delayed release is obtained in multistep processes like spray drying the arabinogalactan and then fluid-bed coating the resultant powder.

Like gum arabic, arabinogalactan can be used alone to encapsulate or partially encapsulate sugars and polyols, high intensity sweeteners, and natural and synthetic flavors. High intensity sweeteners such as aspartame, alitame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be encapsulated in arabinogalactan. When added to chewing gum, a fast release sweetener is obtained. Also, fast release flavors may result when encapsulated in arabinogalactan.

The arabinogalactan may be added to the liquid inside a liquid center gum product. The center fill of a gum product may comprise one or more carbohydrate syrups, glycerin, thickeners, flavors, acidulants, colors, sugars and sugar alcohols in conventional amounts. The ingredients are combined in a conventional manner. The arabinogalactan bulking agent is dissolved in the center-fill liquid and the amount of arabinogalactan added to the center-fill liquid may be about 0.1% to about 20% by weight of the entire chewing gum formula. This method of using the bulking agent in chewing gum can allow for a lower usage level of the bulking agent, can give the bulking agent a smooth release rate, and can reduce or eliminate any possible reaction of the bulking agent with gum base, flavor components or other components, yielding improved shelf stability.

Another method of using the arabinogalactan bulking agent is to add arabinogalactan to the dusting compound of a chewing gum. A rolling or dusting compound is applied to the surface of chewing gum as it is formed. This rolling or dusting compound serves to reduce sticking to machinery as it is formed, reduces sticking of the product to machinery as it is wrapped, and sticking to its wrapper after it is wrapped and being stored. The rolling compound comprises arabinogalactan alone or in combination with mannitol, sorbitol, sucrose, starch, calcium carbonate, talc, other orally acceptable substances or a combination thereof. The rolling compound constitutes from

about 0.25% to about 10.0%, but preferably about 1% to about 3% of weight of the chewing gum composition. The amount of arabinogalactan added to the rolling compound is about 0.5% to 100% of the rolling compound or about 0.005% to about 5% of the chewing gum composition. This method of using arabinogalactan in the chewing gum can allow a lower usage level of the bulking agent.

Another method of using the arabinogalactan bulking agent is to use it in the coating/panning of a pellet chewing gum. Pellet or ball gum is prepared as conventional chewing gum, but formed into pellets that are pillow shaped or into balls. The pellets/balls can be then sugar coated or panned by conventional panning techniques to make a sugar-coated pellet gum. The bulking agent is very stable and highly water soluble, and can be easily added to a sugar solution prepared for sugar panning.

Arabinogalactan may be combined with sucrose, dextrose, maltose, xylitol, lactitol, hydrogenated isomaltulose, erythritol, maltitol and other new alditols in a solution to make a sugar coated pellet gum or a polyol coated pellet gum. Arabinogalactan can also be used alone in solution in an initial gumming stage where aqueous arabinogalactan is applied as a coating and then a powdered arabinogalactan is added to dry the solution, as may be done in some types of "soft" panning procedures. Levels for the use of arabinogalactan in the coating may be about 0.5 to about 40% in a sugar or polyol hard coating, or may be about 5% to 100% of dry solids in the solution or as dry powder used in the soft panning process. This process may then continue with other materials by alternating liquid and powder applications. The amount of arabinogalactan applied may be about 0.1% to 40% of the weight of the chewing gum product, where the coating may be about 10% to 50% of the weight of the finished pellet product.

Like gum arabic, arabinogalactan has many properties that make it an excellent coating and panning modifier. A panning modifier can improve the hardness of the coating to make it tougher, increase stickiness of coating to

improve adhesion to the gum surface, especially edges, and gives additional film strength to improve shelf life of the product by protecting the gum core. Other panning modifiers which may be used in combination with arabinogalactan are gum arabic, maltodextrin, corn syrup, corn syrup solids, gelatin, cellulose type materials like carboxymethyl cellulose or hydroxymethyl cellulose, starch and modified starches, vegetable gums like alginates, locust bean gum, guar gum, and gum tragacanth. Other types of panning modifiers that reduce tack or act as fillers may also be used, such as insoluble carbonates like magnesium carbonate or calcium carbonate and talc. These antitack agents allow the use of a variety of carbohydrates and sugar alcohols to be used in the development of newly panned and coated gum products.

Flavors and high intensity sweeteners may also be added with the pellet coating to yield unique product characteristics. When liquid or encapsulated flavors are added to a coating, they can behave like an antitack agent. Use of arabinogalactan can increase tackiness and help cover the flavor and allow a continuation of the sugar or polyol coating process. Also arabinogalactan with its binding properties may help bind the flavor in the coating. High intensity sweeteners can also be entrapped and stabilized in the coating with the use of arabinogalactan. High intensity sweeteners may be applied from the dissolved coating solution, or may be applied with the powder charge addition. Sweeteners may be encapsulated and blended with the powder charge to increase stability of the high intensity sweetener.

In general, a chewing gum composition typically comprises a water-soluble bulk portion, a water-insoluble chewable gum base portion and typically water-insoluble flavoring agents. The water-soluble portion dissipates with a portion of the flavoring agent over a period of time during chewing. The gum base portion is retained in the mouth throughout the chew.

The insoluble gum base generally comprises elastomers, resins, fats and oils, waxes, softeners and inorganic fillers. Elastomers may include

polyisobutylene, isobutylene-isoprene copolymer and styrene butadiene rubber, as well as natural latexes such as chicle. Resins include polyvinylacetate and terpene resins. Fats and oils may also be included in the gum base, including tallow, hydrogenated and partially hydrogenated vegetable oils, and cocoa butter. Commonly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba. According to the preferred embodiment of the present invention, the insoluble gum base constitutes between about 5 to about 95% by weight of the gum. More preferably the insoluble gum base comprises between 10 and 50% by weight of the gum and most preferably about 20 to about 35% by weight of the gum.

The gum base typically also includes a filler component. The filler component may be calcium carbonate, magnesium carbonate, talc, dicalcium phosphate or the like. The filler may constitute between about 5 and about 60% by weight of the gum base. Preferably, the filler comprises about 5 to about 50% by weight of the gum base.

Gum bases typically also contain softeners, including glycerol monostearate and glycerol triacetate. Further, gum bases may also contain optional ingredients such as antioxidants, colors and emulsifiers. The present invention contemplates employing any commercially acceptable gum base.

The water-soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5 to about 15.0% by weight of the chewing gum. Softeners contemplated by the present invention include glycerin, lecithin and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolysates, corn syrup and combinations thereof may be used as softeners

and binding agents in gum. An aqueous solution of arabinogalactan can also be used as a softener and binding agent in gum.

As mentioned above, the arabinogalactan bulking agent of the present invention will most likely be used in sugarfree gum formulations. However, sugar formulations are also within the scope of the invention. Sugar sweeteners generally include saccharide-containing components commonly known in the chewing gum art which comprise, but are not limited to, sucrose, dextrose, maltose, dextrin, dried invert sugar, fructose, galactose, corn syrup solids and the like, alone or in any combination.

The arabinogalactan bulking agent of the present invention can also be used in combination with other sugarless sweeteners. Generally sugarless sweeteners include components with sweetening characteristics but which are devoid of the commonly known sugars and comprise, but are not limited to, sugar alcohols such as sorbitol, mannitol, xylitol, hydrogenated starch hydrolysates, maltitol, lactitol, hydrogenated isomaltulose and the like, alone or in any combination.

Depending on the particular sweetness release profile and shelf-stability needed, the arabinogalactan bulking agent of the present invention can also be used in combination with coated or uncoated high-potency sweeteners or with high-potency sweeteners coated with other materials and by other techniques.

A flavoring agent may be present in the chewing gum in an amount within the range of from about 0.1 to about 10.0 weight percent and preferably from about 0.5 to about 3.0 weight percent of the gum. The flavoring agents may comprise essential oils, synthetic flavors, or mixture thereof including, but not limited to, oils derived from plants and fruits such as citrus oils, fruit essences, peppermint oil, spearmint oil, clove oil, oil of wintergreen, anise, and the like. Artificial flavoring components are also contemplated for use in gums of the present invention. Those skilled in the art will recognize that natural and artificial flavoring agents may be combined

in any sensorally acceptable blend. All such flavors and flavor blends are contemplated by the present invention.

Optional ingredients such as colors, emulsifiers and pharmaceutical agents may be added to the chewing gum.

5 In general, chewing gum is manufactured by sequentially adding the various chewing gum ingredients to a commercially available mixer known in the art. After the ingredients have been thoroughly mixed, the gum mass is discharged from the mixer and shaped into the desired form such as by rolling into sheets and cutting into sticks, extruding into chunks or casting into
10 pellets.

Generally, the ingredients are mixed by first melting the gum base and adding it to the running mixer. The base may also be melted in the mixer itself. Color or emulsifiers may also be added at this time. A softener such as glycerin may also be added at this time, along with syrup and a portion of the
15 bulking agent/sweetener. Further portions of the bulking agent/sweetener may then be added to the mixer. A flavoring agent is typically added with the final portion of the bulking agent. A high-intensity sweetener is preferably added after the final portion of bulking agent and flavor have been added.

The entire mixing procedure typically takes from five to fifteen minutes,
20 but longer mixing times may sometimes be required. Those skilled in the art will recognize that many variations of the above described procedure may be followed.

After the chewing gum center has been manufactured and shaped, as described above, the sugar or polyol coatings can be applied. Pellet or ball
25 gum is prepared as conventional chewing gum, but formed into pellets that are pillow-shaped or ball-shaped. The pellets or balls can then be coated or panned by conventional panning techniques to make a unique, coated pellet gum. The sugar or polyols used in the coatings are very stable and highly water soluble, and can be easily added to water to make a solution prepared
30 for panning. Sugars or polyols may be combined with other polyols or sugars,

or used alone in solution as the coating on pellet gum. Sugar or polyols can also be added as a powder blended with other powders often used in some types of conventional panning procedures. Sugars or polyols can also be used with panning modifiers and other panning materials to improve product quality. Antitack agents may also be added as panning modifiers, which allow the use of a variety of carbohydrates and sugar alcohols to be used in the development of new panned or coated gum products.

The coating is initially present as a liquid syrup which contains from about 30 to about 80 or 85 weight percent of the coating ingredients previously described herein, and from about 15 to 20 to about 70 weight percent of a solvent such as water. In general, the hard coating process is carried out in a rotating pan. Sugar or sugarless gum center tablets to be coated are placed into the rotating pan to form a moving mass.

The material or syrup which will eventually form the hard coating is applied or distributed over the gum center tablets. Flavoring agents may be added before, during and after applying the syrup to the gum centers. Once the coating has dried to form a hard surface, additional syrup additions can be made to produce a plurality of coatings or multiple layers of hard coating.

In the hard coating panning procedure, syrup is added to the gum center tablets at a temperature range of from about 100°F. to about 250°F. Preferably, the syrup temperature is from about 150°F. to about 200°F. throughout the process in order to prevent the polyol in the syrup from crystallizing. The syrup may be mixed with, sprayed upon, poured over, or added to the gum center tablets in any way known to those skilled in the art.

Each component of the coating on the gum center tablets may be applied in a single hard layer or in a plurality of hard layers. In general, a plurality of layers is obtained by applying single coats, allowing the layers to dry, and then repeating the process. The amount of solids added by each coating step depends chiefly on the concentration of the coating syrup. Any number of coats may be applied to the gum center tablet. Preferably, no

more than about 75 coats are applied to the gum center tablets. More preferably, less than about 60 coats are applied and most preferably, about 30 to about 60 coats are applied. In any event, the present invention contemplates applying an amount of syrup sufficient to yield a coated chewing gum product containing about 10 to about 65 weight percent coating. Preferably, the final product will contain from about 20 to about 50 weight percent hard coating.

Those skilled in the art will recognize that in order to obtain a plurality of hard coated layers, a plurality of premeasured aliquots of coating syrup may be applied to the gum center tablets. It is contemplated, however, that the volume of aliquots of syrup applied to the gum center tablets may vary throughout the coating procedure.

The present invention contemplates that a flavoring agent may be added to the syrup, or applied to the gum center tablets while the syrup coating is drying or after the coating has dried. Furthermore, the flavoring agent may be applied anywhere within the sequence of coats, for example, after the third, twelfth, eighteenth, etc., coats.

Once a coating of syrup is applied to the gum center tablets, the present invention contemplates drying the wet syrup in an inert medium. A preferred drying medium comprises air. Preferably, forced drying air contacts the wet syrup coating in a temperature range of from about 80° to about 115°F. More preferably, the drying air is in the temperature range of from about 90° to about 105°F. The invention also contemplates that the drying air possess a relative humidity of less than about 15 percent. Preferably, the relative humidity of the drying air is less than about 8 percent.

The drying air may be passed over and admixed with the syrup coated gum centers in any way commonly known in the art. Preferably, the drying air is blown over and around the syrup coated gum center at a flow rate, for large scale operations, of about a 2800 cubic feet per minute. If lower quantities of material are being processed, or if smaller equipment is used, lower flow rates

would be used. If a flavoring agent is applied after a syrup coating has been dried, the present invention contemplates drying the flavoring agent with or without the use of a drying medium.

A wide range of changes and modifications to the embodiments of the invention described above will be apparent to persons skilled in the art. For example, while the invention is described with respect to hard-coated chewing gum, it will be appreciated that the process is applicable to coating other food products, such as candies, in which a coating with arabinogalactan would have utility.

Examples

The following examples of the invention and comparative examples are provided by way of explanation and illustration.

The formulas listed in Table 1 comprise various sugar-type formulas in which arabinogalactan can be added to gum after it is dissolved in water and mixed with various aqueous solvents.

TABLE 1
(WEIGHT PERCENT)

	<u>EX. 1</u>	<u>EX. 2</u>	<u>EX. 3</u>	<u>EX. 4</u>	<u>EX. 5</u>	<u>EX. 6</u>	<u>EX. 7</u>	<u>EX. 8</u>
SUGAR	55.6	56.6	55.6	47.0	53.0	53.0	55.6	47.0
BASE	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	1.9	8.9	2.9	6.9	6.9	0.0	2.9
PEPPER-MINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
GLY-CERIN	1.4	1.4	1.4	0.0	0.0	0.0	1.4	0.0
LIQUID/ARABI-NOGA-LACTAN BLEND	10.0	20.0	14.0	30.0	20.0	20.0	22.9	30.0

EXAMPLE 1

Arabinogalactan powder can be added directly to the gum.

EXAMPLE 2

5 An 80 gram portion of arabinogalactan can be dissolved in 120 grams of water at 40°C making a 40% solution and added to gum.

EXAMPLE 3

Arabinogalactan syrup at 50% solids can be added directly to the gum.

EXAMPLE 4

10 A blend of 80 grams of arabinogalactan and 120 grams of water is mixed at 40°C. To this is added 100 grams of glycerin to give a mixture of 27% arabinogalactan, 40% water, and 33% glycerin, and added to gum.

EXAMPLE 5

15 To 140 grams of arabinogalactan syrup at 40% solids is added 60 grams of glycerin to give a 70% arabinogalactan syrup with 30% glycerin, and added to gum.

EXAMPLE 6

20 To 140 grams of arabinogalactan syrup at 40% solids is added 60 grams of propylene glycol giving a 70% arabinogalactan syrup with 30% propylene glycol and added to gum.

EXAMPLE 7

To 140 grams of arabinogalactan syrup at 40% solids is added 89 grams of corn syrup and blended giving a mixture of 61% arabinogalactan syrup and 39% corn syrup.

25 EXAMPLE 8

To a 200 gram quantity of corn syrup is added 100 grams of glycerin. To this mixture is added 75 grams of arabinogalactan and blended at 50°C. This mixture is added to gum.

30 In the next examples of sugar gum formulations, arabinogalactan can be dissolved in water and emulsifiers can be added to the aqueous solution.

5 Example solutions can be prepared by dissolving 15 grams of arabinogalactan in 70 grams water and adding 15 grams of emulsifiers of various hydrophilic-lipophilic balance (HLB) values to the solution. The mixtures can then be used in the following formulas. Example 9 uses a mixture of arabinogalactan and water with no emulsifier. The HLB value of the emulsifiers used in Examples 10-14 are listed in Table 2.

TABLE 2
(WEIGHT PERCENT)

	<u>EX. 9</u>	<u>EX. 10</u>	<u>EX. 11</u>	<u>EX. 12</u>	<u>EX. 13</u>	<u>EX. 14</u>
SUGAR	50.7	50.7	50.7	50.7	50.7	50.7
BASE	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	12.9	12.9	12.9	12.9	12.9
GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
DEXTROSE MONOHY- DRATE	9.9	9.9	9.9	9.9	9.9	9.9
PEPP. FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
BULKING AGENT EMUL- SIFIER/ WATER MIXTURE	5.0	5.0	5.0	5.0	5.0	5.0
	None	HLB=2	HLB=4	HLB=6	HLB=9	HLB=12

10

EXAMPLES 15-20

15

The same as the formulations made in Examples 9-14, respectively, except that the flavor can be mixed together with the aqueous arabinogalactan solution and emulsified before adding the mixture to the gum batch.

The following Tables 3 through 10 are examples of gum formulations that demonstrate formula variations in which arabinogalactan or arabinogalactan syrup may be used.

Examples 21-24 in Table 3 demonstrates the use of arabinogalactan in low-moisture sugar formulations showing less than 2% theoretical moisture:

TABLE 3
(WEIGHT PERCENT)

	<u>EX. 21</u>	<u>EX. 22</u>	<u>EX. 23</u>	<u>EX. 24</u>
SUGAR	57.9	53.9	48.9	25.0
GUM BASE	19.2	19.2	19.2	19.2
CORN ^a SYRUP	6.0	6.0	-	-
DEXTROSE MONOHY- DRATE	10.0	10.0	10.0	10.0
LACTOSE	0.0	0.0	0.0	5.0
GLYCERIN ^b	5.0	5.0	11.0	14.9
FLAVOR	0.9	0.9	0.9	0.9
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

Examples 25-28 in Table 4 demonstrate the use of arabinogalactan in medium-moisture sugar formulations having about 2% to about 5% moisture.

Examples 29-32 in Table 5 demonstrate the use of arabinogalactan in high-moisture sugar formulations having more than about 5% moisture.

TABLE 4
(WEIGHT PERCENT)

	<u>EX. 25</u>	<u>EX. 26</u>	<u>EX. 27</u>	<u>EX. 28</u>
SUGAR	52.5	48.5	43.5	25.0
GUM BASE	19.2	19.2	19.2	19.2
CORN SYRUP ^a	15.0	15.0	13.0	12.5
DEXTROSE MONOHYDRATE	10.0	10.0	10.0	10.0
GLYCERIN ^b	1.4	1.4	3.4	7.4
FLAVOR	0.9	0.9	0.9	0.9
ARABINO-GALACTAN	1.0	5.0	10.0	25.0

5 ^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

TABLE 5
(WEIGHT PERCENT)

10

	<u>EX. 29</u>	<u>EX. 30</u>	<u>EX. 31</u>	<u>EX. 32</u>
SUGAR	50.0	46.0	41.0	25.0
GUM BASE	24.0	24.0	24.0	24.0
CORN SYRUP	24.0	24.0	24.0	24.6
GLYCERIN	0.0	0.0	0.0	0.4
FLAVOR	1.0	1.0	1.0	1.0
ARABINO-GALACTAN	1.0	5.0	10.0	25.0

15

Examples 33-36 in Table 6 and Examples 37-44 in Tables 7 and 8 demonstrate the use of arabinogalactan in low- and high-moisture gums that are sugar-free. Low- moisture gums have less than about 2% moisture, and high-moisture gums have greater than 2% moisture.

TABLE 6
(WEIGHT PERCENT)

	<u>EX. 33</u>	<u>EX. 34</u>	<u>EX. 35</u>	<u>EX. 36</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	41.0	21.0
MANNITOL	12.0	12.0	12.0	12.0
GLYCERIN ^b	10.0	10.0	10.0	15.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

5

TABLE 7
(WEIGHT PERCENT)

	<u>EX. 37</u>	<u>EX. 38</u>	<u>EX. 39</u>	<u>EX. 40</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	31.0	6.0
LIQUID SORBITOL*	10.0	10.0	20.0	30.0
MANNITOL	10.0	10.0	10.0	10.0
GLYCERIN	2.0	2.0	2.0	2.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

10

*Sorbitol Liquid contains 70% sorbitol, 30% water

TABLE 8
(WEIGHT PERCENT)

	<u>EX. 41</u>	<u>EX. 42</u>	<u>EX. 43</u>	<u>EX. 44</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	44.0	35.0	15.0
HSR SYRUP*	10.0	10.0	10.0	10.0
MANNITOL	8.0	8.0	8.0	8.0
GLYCERIN**	4.0	6.0	10.0	15.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

5

* Hydrogenated starch hydrolyzate syrup

** Glycerin and HSH syrup may be blended or co-evaporated

Table 9 shows sugar chewing formulations that can be made with various types of sugars.

10

TABLE 9
(WEIGHT PERCENT)

	<u>EX. 45</u>	<u>EX. 46</u>	<u>EX. 47</u>	<u>EX. 48</u>	<u>EX. 49</u>	<u>EX. 50</u>
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	44.5	24.5	39.5	19.5	29.5	19.5
GLYCERIN	1.4	6.4	1.4	6.4	1.4	6.4
CORN SYRUP	14.0	14.0	14.0	14.0	14.0	14.0
DEXTROSE	5.0	5.0	-	-	10.0	5.0
LACTOSE	5.0	5.0	10.0	10.0	-	-
FRUCTOSE	5.0	5.0	10.0	10.0	10.0	5.0
INVERT SUGAR	-	-	-	-	10.0	10.0
MALTOSE	-	-	-	-	-	-
CORN SYRUP SOLIDS	-	-	-	-	-	-
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
ARABINO- GALACTAN	5.0	20.0	5.0	20.0	5.0	20.0

TABLE 9 (Cont'd)
(WEIGHT PERCENT)

	<u>EX. 51</u>	<u>EX. 52</u>	<u>EX. 53</u>	<u>EX. 54</u>	<u>EX. 55</u>	<u>EX. 56</u>
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	29.5	19.5	29.5	19.5	37.5	22.5
GLYCERIN	1.4	6.4	1.4	6.4	1.4	6.4
CORN SYRUP	14.0	14.0	14.0	14.0	11.0	11.0
DEXTROSE	10.0	5.0	10.0	5.0	10.0	5.0
LACTOSE	-	-	-	-	-	-
FRUCTOSE	10.0	5.0	10.0	5.0	5.0	5.0
INVERT SUGAR	10.0	10.0	-	-	5.0	5.0
MALTOSE	-	-	10.0	10.0	-	-
CORN SYRUP SOLIDS	-	-	-	-	5.0	5.0
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
ARABINOGA- LACTAN	5.0	20.0	5.0	20.0	5.0	20.0

Table 10 shows chewing gum formulations that are free of sugar.
These formulations can use a wide variety of other non-sugar alditols.

TABLE 10
(WEIGHT PERCENT)

	<u>EX. 57</u>	<u>EX. 58</u>	<u>EX. 59</u>	<u>EX. 60</u>	<u>EX. 61</u>	<u>EX. 62</u>
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	8.0	8.0	8.0	8.0	8.0	2.0
SORBITOL	38.0	28.0	28.0	23.0	22.0	10.0
MANNITOL	-	10.0	10.0	10.0	10.0	6.0
SORBITOL LIQUID	17.0	17.0	-	-	-	-
LYCASIN	-	-	17.0	12.0	8.0	20.0
MALITITOL	-	-	-	10.0	-	-
XYLITOL	-	-	-	-	15.0	15.0
LACTITOL	-	-	-	-	-	-
PALATINIT	-	-	-	-	-	-
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	10.0	10.0	10.0	10.0	10.0	20.0

TABLE 10 (Cont'd)
(WEIGHT PERCENT)

	EX. 63	EX. 64	EX. 65	EX. 66	EX. 67	EX. 68
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	8.0	8.0	8.0	2.0	8.0	2.0
SORBITOL	32.0	27.0	22.0	31.0	10.0	10.0
MANNITOL	8.0	8.0	8.0	-	-	-
SORBITOL LIQUID	5.0	-	-	-	-	-
LYCASIN	-	5.0	5.0	5.0	10.0	20.0
MALITITOL	-	5.0	-	-	-	-
XYLITOL	-	-	-	15.0	15.0	-
LACTITOL	10.0	10.0	10.0	-	-	-
PALATINIT	-	-	10.0	10.0	10.0	10.0
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	10.0	10.0	10.0	10.0	20.0	20.0

High-intensity sweeteners such as aspartame, acesulfame K, or the salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be used in any of the Examples listed in Tables 3, 4, 5, 6, 7, 8, 9 and 10. Since arabinogalactan has less sweetness than some of the sugars used in sugar gum, and some of the alditols in sugar-free gum, a high-intensity sweetener may be need to obtain the proper level of sweetness.

High-intensity sweeteners may also be modified to control their release in chewing gum formulations containing arabinogalactan. This can be controlled by various methods of encapsulation, agglomeration, absorption, or a combination of methods to obtain either a fast or slow release of the sweetener. Sweetener combinations, some of which may be synergistic, may also be included in the gum formulations containing arabinogalactan.

The following examples show the use of high- intensity sweeteners in chewing gum formulations with arabinogalactan.

EXAMPLE 69

5 Aspartame at a level of 0.2% may be added to any of the formulas in Tables 3 through 10 by replacing 0.2% of the arabinogalactan.

EXAMPLE 70

 Alitame at a level of 0.03% may be added to any of the formulas in Tables 3 through 10 by replacing 0.03% of the arabinogalactan.

EXAMPLE 71

10 Sucralose at a level of 0.07% may be added to any of the formulas in Tables 3 through 10 by replacing 0.07% of the arabinogalactan.

EXAMPLE 72

 Thaumatococcus at a level of 0.02% may be added to any of the formulas in Tables 3 through 10 by replacing 0.02% of the arabinogalactan.

15 EXAMPLE 73

 Glycyrrhizin at a level of 0.4% may be added to any of the formulas in Tables 3 through 10 by replacing 0.4% of the arabinogalactan.

20 High-intensity sweeteners may also be combined with other high-intensity sweeteners, with or without encapsulation, agglomeration or absorption, and used in chewing gum. Examples are:

EXAMPLE 74

 Aspartame and acesulfame K at a 1:1 ratio may be added to any of the formulas in Tables 3 through 10 at a level of 0.15% by replacing 0.15% of the arabinogalactan.

25 EXAMPLE 75

 Aspartame and alitame at a ratio of 9:1 aspartame: alitame may be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

EXAMPLE 76

Aspartame and thaumatin at a ratio of 9:1 aspartame:thaumatin can be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

5

EXAMPLE 77

Sucralose and alitame in a ratio of 3:1 sucralose: alitame can be added to any of the formulas in Tables 3 through 10 at a level of 0.5% by replacing 0.5% of the arabinogalactan.

EXAMPLE 78

10

Alitame and glycyrrhizin in a ratio of 1:12 alitame:glycyrrhizin can be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

EXAMPLE 79

15

Aspartame and glycyrrhizin in a ratio of 1:14 aspartame:glycyrrhizin can be added to any of the formulas in Tables 3 through 10 at a level of 0.3% by replacing 0.3% of the arabinogalactan.

20

As noted earlier, the gum formulas can be prepared as stick or tab products in the sugar or sugarless type formulations. These formulas can also be made in a pellet or pillow shape pellet or a round ball or any other shape of product for coating/panning. However, gum formulas are generally adjusted to a higher level of gum base to give a more consumer acceptable size of gum bolus.

25

Keeping this in mind, if a coating of about 25% of the total product is added to a pellet core as sugar or polyols, the gum base in the pellet core should also be increased by 25%. Likewise, if a 33% coating is applied, the base levels should also be increased by 33%. As a result, gum centers are usually formulated with about 25% to about 40% gum base with a corresponding decrease in the other ingredients except flavor. Generally flavors increase with the level of gum base as the base tends to bind flavors into the gum and more flavor is needed to give a good flavorful product.

30

However flavors can also be added to the coating to give increased flavor impact and more flavor perception.

Some typical sugar type gum center formulations are shown in Table 11.

5

TABLE 11
(WEIGHT PERCENT)

	<u>EX. 80</u>	<u>EX. 81</u>	<u>EX. 82</u>	<u>EX. 83</u>	<u>EX. 84</u>	<u>EX. 85</u>
SUGAR	52.0	49.0	48.0	44.0	41.0	39.0
GUM BASE	26.0	30.0	35.0	26.0	30.0	35.0
CORN SYRUP	20.0	19.0	15.0	18.0	17.0	14.0
GLYCERIN	1.0	1.0	1.0	1.0	1.0	1.0
PEPPERMINT FLAVOR	1.0	1.0	1.0	1.0	1.0	1.0
DEXTROSE MONOHYDRATE	-	-	-	10.0	10.0	10.0

10

Formulations with or without arabinogalactan can also be made similar to those found in Tables 1-5 for low, medium, and high moisture formulas. Higher levels of base may be used with a corresponding decrease in other ingredients. Also, other sugars may be used in the gum center as found in Table 9.

15

Arabinogalactan can then be used in the coating formula on the various pellet gum formulations. The following Table 12 shows some sugar and dextrose type formulas:

TABLE 12
(DRY WEIGHT PERCENT)

	<u>EX. 86</u>	<u>EX. 87</u>	<u>EX. 88</u>	<u>EX. 89</u>	<u>EX. 90</u>	<u>EX. 91</u>
SUGAR	97.1	95.4	94.1	96.9	95.1	93.6
ARABINO- GALACTAN	2.0	3.0	4.0	2.0	3.0	4.0
TITANIUM DIOXIDE	0.5	1.0	1.0	-	-	-
CALCIUM CARBONATE	-	-	-	0.5	1.0	2.0
FLAVOR	0.3	0.5	0.8	0.5	0.8	0.3
WAX	0.1	0.1	0.1	0.1	0.1	0.1

20

TABLE 12 (Cont'd)
(DRY WEIGHT PERCENT)

	EX. 92	EX. 93	EX. 94	EX. 95
DEXTROSE MONOHYDRATE	97.6	95.4	97.2	94.5
ARABINO- GALACTAN	1.5	3.0	1.5	3.0
TITANIUM DIOXIDE	0.5	1.0	-	-
CALCIUM CARBONATE	-	-	1.0	2.0
FLAVOR	0.3	0.5	0.2	0.4
WAX	0.1	0.1	0.1	0.1

5 The above formulations are made by making a syrup by dissolving the sugar and arabinogalactan in solution at about 75% solids at boiling, and suspending titanium dioxide or calcium carbonate in this syrup. Flavor is not mixed with the hot syrup, but added at low levels with one or more coats. After the final coats are applied and dried, wax is applied to give a smooth polish.

10 The above process gives a hard shell coating. Often a dry charge of powdered sugar or dextrose monohydrate may be used. This gives a somewhat softer coating. A dry charge may be used to build up a coating, but then finished with a straight syrup to obtain a hard shell. Table 13 gives these types of formulas.

TABLE 13
(DRY WEIGHT PERCENT)

	<u>EX. 96</u>	<u>EX. 97</u>	<u>EX. 98</u>	<u>EX. 99</u>	<u>EX. 100</u>	<u>EX. 101</u>
SUGAR	77.5	81.4	-	-	87.5	-
DEXTROSE MONOHYDRATE	-	-	77.5	86.3	-	87.1
POWDER SUGAR*	20.0	15.0	-	-	-	-
POWDER DEXTROSE*	-	-	20.0	10.0	-	-
ARABINO- GALACTAN POWDER	2.0	3.0	2.0	3.0	8.0	8.0
ARABINO- GALACTAN SOLUTION	-	-	-	-	4.0	4.0
FLAVOR	0.4	0.5	0.4	0.6	0.4	0.8
WAX	0.1	0.1	0.1	0.1	0.1	0.1

5

* Powder and/or crystalline sugar may be used.

In Examples 96-99, arabinogalactan is blended in the sugar syrup. In Examples 100 and 101, arabinogalactan powder is dry charged after a arabinogalactan solution is applied in the first stages of coating, then this is followed by a hard shell coating of sugar solution or dextrose solution.

10

Arabinogalactan may also be used in coating of sugarless gum centers. Like sugar gum centers, the base formulation can be increased in proportion to the amount of coating applied to the center. Formulations with and without arabinogalactan similar to those found in Tables 6, 7 or 8 for low and high moisture gum can be used to make gum centers. Generally, the base level may be increased to 30-46% with the other ingredients proportionally reduced. Some typical gum formulas are in Table 14.

15

TABLE 14
(WEIGHT PERCENT)

	<u>EX. 102</u>	<u>EX. 103</u>	<u>EX. 104</u>	<u>EX. 105</u>	<u>EX. 106</u>	<u>EX. 107</u>	<u>EX. 108</u>
GUM BASE	35.0	35.0	30.0	30.0	30.0	40.0	30.0
CALCIUM CARBONATE	-	-	5.0	10.0	15.0	-	-
SORBITOL	43.3	45.3	46.3	40.3	44.8	41.7	46.5
MANNITOL	10.0	10.0	5.0	10.0	-	8.0	10.0
GLYCERIN	-	8.0	2.0	-	8.0	2.0	2.0
SORBITOL LIQUID	10.0	-	10.0	8.0	-	6.0 ^{a)}	10.0 ^{a)}
FLAVOR	1.5	1.5	1.5	1.5	2.0	2.0	1.3
HIGH INTENSITY SWEETENER	0.2	0.2	0.2	0.2	0.2	0.3	0.2

- 5 a) Lycasin brand hydrogenated starch hydrolyzate used instead of sorbitol liquid

10 In the above center formulations, the high intensity sweetener used is aspartame. However other high intensity such as alitame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin and combinations thereof may be used in any of the examples with the level adjusted for sweetness.

15 Lycasin and other polyols such as maltitol, xylitol, lactitol and hydrogenated isomaltulose may also be used in the gum center formulations at various levels similar to those shown in Table 10. The texture may be adjusted by varying glycerin or sorbitol liquid. Sweetness of the center formulation can also be adjusted by varying the level of high intensity sweetener.

20 Arabinogalactan is especially useful in sugarless coatings with xylitol, sorbitol, maltitol, lactitol, hydrogenated isomaltulose and erythritol. Arabinogalactan acts as a binder, film former, hardener of the coated pellet. The following table gives formulas for a xylitol coating:

TABLE 15
(DRY WEIGHT PERCENT)

	<u>EX. 109</u>	<u>EX. 110</u>	<u>EX. 111</u>	<u>EX. 112</u>	<u>EX. 113</u>	<u>EX. 114</u>
XYLITOL	94.8	92.4	90.7	90.1	89.9	88.8
ARABINO- GALACTAN	4.0	6.0	7.0	8.5	8.5	10.0
FLAVOR	0.5	0.5	0.7	0.7	0.9	0.5
TITANIUM DIOXIDE	0.5	0.9	-	0.5	0.5**	0.5**
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1
COLOR*	-	-	1.4	-	-	-

5

- * Lake color dispersed in xylitol solution
 ** Calcium carbonate used in place of titanium dioxide

10

The above formulas are used to coat pellets by applying a xylitol/arabinogalactan solution in multiple coats and air drying. Color or whitener is also mixed in the solution. After pellets have been coated and dried, talc and wax are added to give a polish.

Like xylitol, erythritol coating also requires a binder, film former, and hardener in the coating to make an acceptable product. The following formulations can be made:

TABLE 16
(DRY WEIGHT PERCENT)

	<u>EX. 115</u>	<u>EX. 116</u>	<u>EX. 117</u>	<u>EX. 118</u>	<u>EX. 119</u>	<u>EX. 120</u>
ERYTHRITOL	93.8	91.5	89.2	90.1	88.4	86.8
ARABINO- GALACTAN	5.0	7.0	8.5	8.5	10.0	12.0
FLAVOR	0.5	0.4	0.7	0.7	0.9	0.5
TITANIUM DIOXIDE	0.5	0.9	-	0.5	0.5	0.5
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1
COLOR	-	-	1.4*	-	-	-

5 * Lake color dispersed in erythritol solution

The above formulas are used to coat pellets by applying a erythritol/ arabinogalactan solution in multiple coats and air drying. Color or whitener is also mixed in the solution. After pellets have been coated and dried, talc and wax are added to give a polish.

10 For coating formulas based on sorbitol, maltitol, lactitol, and hydrogenated isomaltulose, arabinogalactan can be used as a binder and film former, and a crystallization modifier to help facilitate coating. Generally these polyols are more difficult to coat using only a straight syrup, but with proper technique a good smooth hard shell can be made. However, it may be preferable to add a dry charge to quicken the drying process before the pellets get too sticky. The following formulations may be used.

15

TABLE 17
(DRY WEIGHT PERCENT)

	<u>EX. 121</u>	<u>EX. 122</u>	<u>EX. 123</u>	<u>EX. 124</u>	<u>EX. 125</u>	<u>EX. 126</u>
SORBITOL	96.8	94.9	92.1	86.8	76.1	69.5
SORBITOL POWDER	-	-	-	10.0	20.0	25.0
ARABINO- GALACTAN	2.0	4.0	6.0	2.0	3.0	4.0
FLAVOR	0.5	0.4	0.7	0.5	0.3	0.7
TITANIUM DIOXIDE	0.5	0.5	1.0	0.5	0.4	0.6
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1

5 Sorbitol powder is used to dry charge in the early stages of coating. Sorbitol, arabinogalactan, and whitener is blended into a syrup and applied to pellets. After all coating is applied and dried, talc and wax are added to give a polish.

10 In a similar manner, coatings with maltitol, lactitol, and hydrogenated isomaltulose may be made in the coating formulas in Table 17 by replacing sorbitol with any one of the other polyols and sorbitol powder with the polyol powder. Like sorbitol, the other polyols may become sticky during the coating and drying process, so the dry powder charge may be needed to give the proper drying. In the later stages of the coating process, less arabinogalactan
15 could be used and a more pure polyol syrup could be used to give a smooth surface. Also, the dry charge would only be used in the early stages of the coating process.

20 In addition to dry charging with the specific polyol, other ingredients may be added to the dry charge to help absorb moisture. These materials could be inert such as talc, calcium carbonate, magnesium carbonate, starches, gums like arabinogalactan, gum talha, gum arabic or other moisture absorbing materials. Also, powdered sweeteners or flavors could be added with the dry charge.

Some polyols such as sorbitol, maltitol, lactitol, or hydrogenated isomaltulose are not sufficiently sweet compared to sugar or xylitol, so high intensity sweeteners may be added to the coating, such as aspartame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, glycyrrhizin, and combinations thereof. If a hot syrup is applied, heat may degrade the sweetener so only stable sweeteners should be used. Generally high intensity sweeteners are added with the polyol/arabinogalactan solution to obtain an even distribution in the coatings.

Liquid flavors generally are not added throughout the coating but at specific points throughout the process. When flavor is added, less air is used for drying until the flavor coating is covered by the next coatings and dried. Flavors may be various spearmint, peppermint, wintergreen, cinnamon, and fruit flavors to yield a wide variety of flavored chewing gum products.

It should be appreciated that the compositions and methods of the present invention are capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The invention may be embodied in other forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

I CLAIM:

1. A chewing gum composition comprising:
 - a) about 5% to about 95% gum base
 - b) about 0.1% to about 10% of a flavoring agent, and
 - 5 c) about 5% to about 95% bulking and sweetening agents, the bulking and sweetening agents comprising arabinogalactan.
2. The chewing gum composition of claim 1 wherein the arabinogalactan is in the form selected from the group consisting of powder arabinogalactan, arabinogalactan syrup and mixtures thereof.
- 10 3. A chewing gum product including arabinogalactan wherein the arabinogalactan is used as a dusting agent on the surface of the gum.
4. A coated chewing gum product comprising a gum pellet coated with a hard coating, the hard coating comprising arabinogalactan.
- 15 5. The method of Claim 4 wherein the arabinogalactan comprises 0.5 to 40% of the hard coating.
6. The method of Claim 4 wherein the hard coating further comprises a polyol selected from the group consisting of xylitol, lactitol, maltitol, hydrogenated isomaltulose, erythritol and mixtures thereof.
- 20 7. The method of Claim 4 wherein the hard coating further comprises a flavor.
8. The method of Claim 4 wherein the hard coating further comprises a high potency sweetener.
- 25 9. The method of Claim 4 wherein the hard coating further comprises a sugar selected from the group consisting of sucrose, dextrose, maltose and mixtures thereof.

10. The method of Claim 4 wherein the hard coating further comprises a coating modifier.

11. A method of making chewing gum comprising the steps of:

- 5 a) coevaporating an aqueous solution comprising arabinogalactan and a plasticizing agent to form a syrup, and
b) mixing the syrup with gum base, bulking agents and flavoring agents to produce a gum composition.

12. A chewing gum composition sweetened at least in part by aspartame, the gum composition containing an effective amount of
10 arabinogalactan to stabilize the aspartame against degradation into non-sweetening derivatives.

13. A method of making chewing gum comprising the steps of:

- 15 a) codrying a solution containing arabinogalactan and a sweetener selected from the group consisting of sugar sweeteners, alditol sweeteners and high-potency sweeteners, and
b) mixing the codried arabinogalactan/sweetener with gum base and flavoring agents to produce a gum composition.

14. A liquid filled chewing gum product wherein the liquid fill comprises arabinogalactan.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/18382

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A23G 3/30

US CL :426/3, 5, 6

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/3, 5, 6

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 4,824,681 A (SCHOBEL ET AL) 25 April 1989 (25.04.89), see entire document.	1, 2, 12 ----- 11, 13
X — Y	US 4,822,622 A (DOKUZOVIC ET AL) 18 April 1989 (18.04.89), see entire document.	1, 2, 12 ----- 11, 13
X — Y	US 4,384,004 A (CEA ET AL) 17 May 1983 (17.03.83), see entire document.	1, 2, 12 ----- 11, 13
X	US 5,458,890 A (WILLIFORD ET AL) 17 October 1995 (17.10.95), see entire document.	3
X	US 4,867,989 A (SILVA ET AL) 19 September 1989 (19.09.89),	4-10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

14 JANUARY 1998

Date of mailing of the international search report

10 FEB 1998

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/18382

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,292,329 A (OGAWA ET AL) 29 September 1981 (29.09.81), see entire document.	14
Y	WO 92/08370 A (YATKA ET AL) 29 May 1992 (29.05.92), see entire document.	11, 13
Y	WO 91/15941 A (YATKA) 31 October 1991 (31.10.91), see entire document.	11, 13
A	US 4,228,198 A (BURGE ET AL) 14 October 1980 (14.10.80).	
X	US 4,867,989 A (SILVA ET AL) 19 September 1989 (19.09.89), see entire document.	4-10

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